GGOS

Global Geodetic Observing System

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(on behalf of GGOS)

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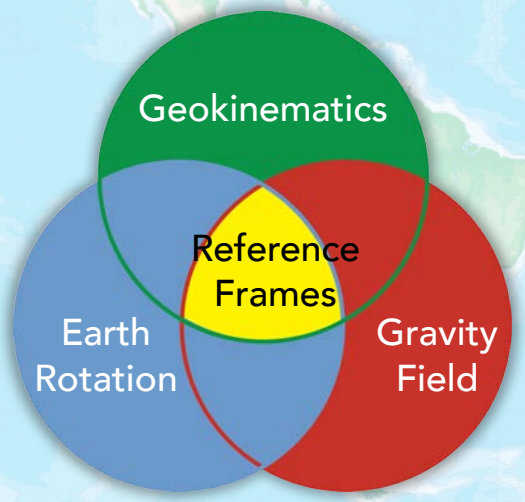
Global Geodetic Observing System

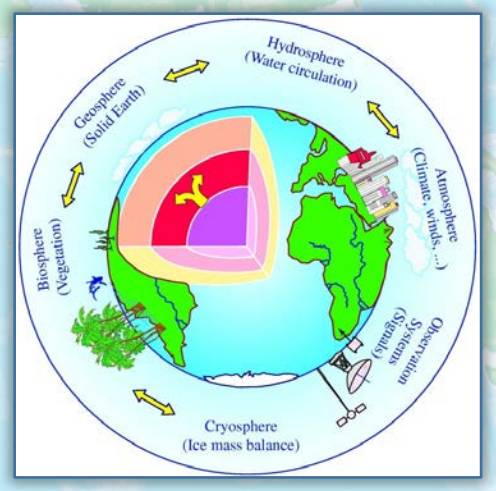
- Observing System of the International Association of Geodesy (IAG)
- Vision: Advance our understanding of the dynamic Earth system by quantifying our planet's changes in space and time
- GGOS works with IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and for global change research
- Partner member of WDS since January 2016
  - Extensive cooperation with other WDS network members (IGS, ILRS, IVS, IDS, etc.) and regular members (e.g., CDDIS)

Geodesy 101

- Geodesy measures:
  1. Shape/geometry of the Earth
     - Topography, bathymetry, ice surface, sea level
  2. Orientation of the Earth in space
     - Polar motion, Earth rotation, nutation, precession
  3. Gravity field of the Earth
     - Gravity, geoid

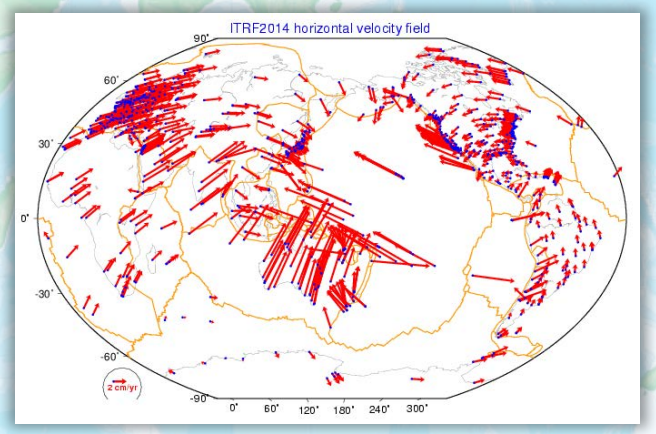


- Space geodesy:
  - Making these measurements between ground-based instruments and objects in space
  - Geodetic techniques observe the components of the System Earth:
    - Solid Earth (deformation, gravity)
    - Atmosphere (signal travel time)
    - Hydrosphere (gravity, altimetry)
    - Cryosphere (laser/radar scanning)



Space geodesy: Motivation

- Everything is moving!
- Earth processes can have a devastating impact on our society and our economies (earthquakes, rising sea level, floods, drought, storms, tsunamis, etc.)
- Geodesy monitors the Earth system, e.g.,
  - Plate motions
  - Solid Earth loading phenomena (ice, ocean, atmosphere)
  - Earthquakes …
- Space geodesy networks are fundamental to monitor and understand Earth processes for both ground and space measurements



http://itrf.ign.fr

GGOS: Cooperative operation

- GGOS relies upon cooperation and participation of the IAG services
  - Networks of observing stations, providing data
  - Analysis centers, generating products
  - Data centers, archiving data and products
  - User community, utilizing data and products for research and applications
- Data and derived products managed by long-term archives
  - Several both network and regular members of WDS
  - Open data policy
  - Utilize ISO standards where applicable

International geodetic services

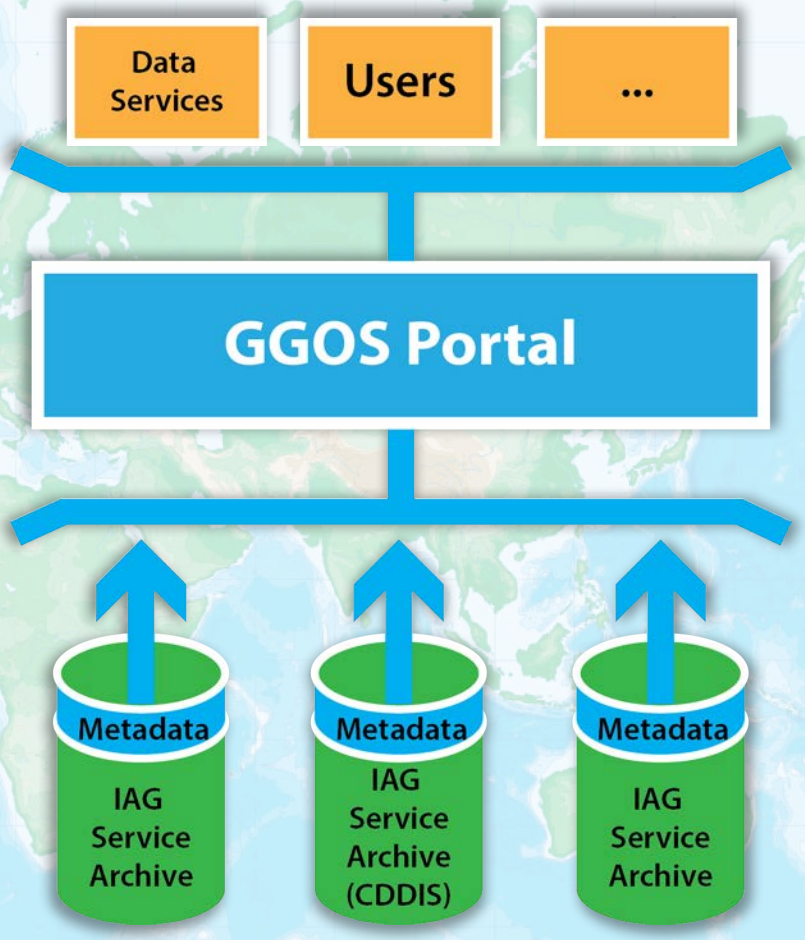
- IAG established international, cooperative partnerships to facilitate research
- Services function as "cooperating federations" dedicated to a particular type of data
- Provide data and products on an operational basis to geodesy analysts as well as a broader scientific community
- Examples of a successful model of community management:
  - Develop standards
  - Self-regulating
  - Define and deliver products using pre-determined schedules
- Successful operation through cooperation of many international organizations who leverage their respective limited resources to all levels of service functionality

IGS · International Laser Ranging Service · IVS · IDS

All are network members of → ICSU WORLD DATA SYSTEM

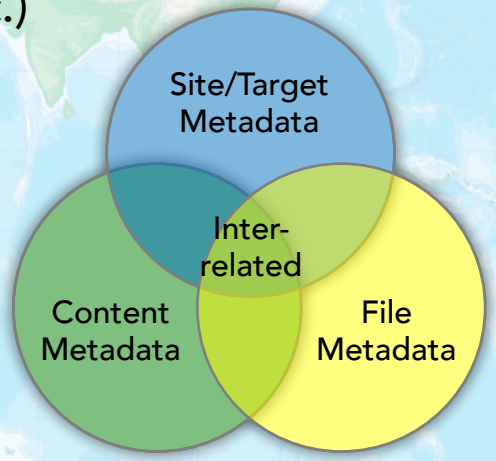
GGOS Portal: Data discovery

- GGOS information
  - GGOS focus areas
  - Science topics
- Access
  - Discovery: search data/product catalogs
  - Map viewer: display data
  - Applications: data mining of GGOS products



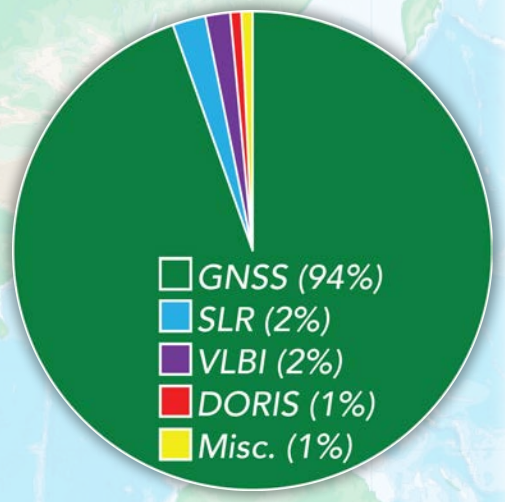
GGOS: Metadata efforts

- Efforts within Standing Committee on Data and Information (part of GGOS Bureau of Networks and Communications)
  - Establishing a Metadata Working Group to help formulate a plan for GGOS metadata and advise on implementation
- Metadata implementation essential to GGOS Portal and will focus on data products and descriptive information
- Developing a proposal for a "GGOS Metadata Schema" for review within the MWG and the services
  - Compatible with standards (ISO 19115, EOSDIS, etc.) and new efforts (eGeodesy)
- Incorporate additional metadata required by IAG services
  - Station, target, … information



GGOS archive example: CDDIS

- One of the data centers supporting the IAG services and thus a contributor to GGOS
- Regular member of WDS
- Archive consists of data and derived products from over 1500 observing sites from about 1000 locations around the world, going back in time as far as 1975
  - File size is typically <2-10 Mb/data or product granule
  - Total archive size: ~15.7Tb
  - Ingest rate: ~9.5Gb (90K files)/day
  - Distribution rate: ~475Gb (~4.4M files)/day
  - Multi-day, daily, hourly, sub-hourly
  - Varying latencies (minutes, hours, days)
  - Archive is updated with new data/product files on varying time scales, dependent on the data type, from a sub-daily basis to weekly basis



CDDIS Crustal Dynamics Data Information System

EOSDIS

NASA

Successes/Challenges/Best Practices

- Successes:
  - Cooperation with global institutions to further scientific research through geodesy infrastructure
  - Expansion of cooperating network
  - Inclusion of additional measurements
- Challenges:
  - Inclusive metadata schema to address data discovery requirements
  - Disparate services have different requirements
- Best practices:
  - Open data policy
  - Collaboration among contributing services in various areas:
    - Data archiving
    - Metadata
  - Creation of bureaus to focus on common topics
    - Network development/observations
    - Product development

Thank you!

- For more information:
  - GGOS: http://ggos.org
  - GGOS portal: http://www.ggos-portal.org
  - IAG: http://www.iag-aig.org
  - IAG services:
    - International GNSS Service (IGS): http://www.igs.org
    - International Laser Ranging Service (ILRS): http://ilrs.gsfc.nasa.gov
    - International VLBI Service for Geodesy and Astrometry (IVS): http://ivscc.gsfc.nasa.gov
    - IDS: http://ids-doris.org
  - CDDIS: http://cddis.nasa.gov
  - EOSDIS: http://earthdata.nasa.gov